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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/583,230	06/16/2006	Fabien Frederic Jousse	T7106(C)	8226

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UNILEVER PATENT GROUP
800 SYLVAN AVENUE
AG West S. Wing
ENGLEWOOD CLIFFS, NJ 07632-3100

EXAMINER	
KWAK, DEAN P	
ART UNIT	**PAPER NUMBER**
1797	

NOTIFICATION DATE	DELIVERY MODE
06/24/2010	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentgroupus@unilever.com

Office Action Summary	**Application No.** 10/583,230	**Applicant(s)** JOUSSE, FABIEN FREDERIC	
	Examiner Dean Kwak	**Art Unit** 1797	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02 April 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,4,5 and 7-14* is/are pending in the application.

4a) Of the above claim(s) *7-12* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,4,5,13 and 14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

In view of the arguments in the Appeal Brief filed on 02 April 2010, PROSECUTION IS HEREBY REOPENED. New rejections are set forth below.

To avoid abandonment of the application, appellant must exercise one of the following two options:

(1) file a reply under 37 CFR 1.111 (if this Office action is non-final) or a reply under 37 CFR 1.113 (if this Office action is final); or,

(2) initiate a new appeal by filing a notice of appeal under 37 CFR 41.31 followed by an appeal brief under 37 CFR 41.37. The previously paid notice of appeal fee and appeal brief fee can be applied to the new appeal. If, however, the appeal fees set forth in 37 CFR 41.20 have been increased since they were previously paid, then appellant must pay the difference between the increased fees and the amount previously paid.

A Supervisory Patent Examiner (SPE) has approved of reopening prosecution by signing below:

/Jill Warden/
Supervisory Patent Examiner, Art Unit 1797

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 1, 4, 5, 13 & 14 are rejected under 35 U.S.C. 112, first paragraph, because the specification does not reasonably provide enablement for "*1,000 microfluidic reactors*". The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make the invention commensurate in scope with these claims. The specification (P3/[0044] & Figs. 1, 2) is not enabling because it does not clearly stat how 1,000 reactors and channels are arranged via an upstream channel or channels as recited in Claim 1. In addition, viewing at Fig. 1 although the reactors 2 & 4 may have been arranged in parallel, it appears that the reactors 2 & 5 are in series, not in parallel. Further, it is unclear if the resistance of each of the upstream channels of all the reactors is at least 10 times (Claim 1) or 100 times (Claim 4) larger than the resistance of the downstream channel or channels is referring to a percentage of the resistance (or ratio) or actual numerical values of the resistance.

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 13 & 14 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding Claim 13, it is unclear if Applicant is trying to claim dependency on Claim 1 or not. If Claim 13 is independent of Claim 1, it is advisable to revise the claim to include all the limitations of Claim 1.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

7. Claims 1, 4, 5, 13 & 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Anderson et al. (PG Pub 2003/0053934).

Regarding Claims 1, 4 & 5, Anderson et al. disclose a microfluidic system (e.g., microfluidic device, Abstract & Fig. 3) comprising first and second fluid supply sources (e.g., one or more inlet microconduits 102, 103, 202, 203, 302, 303, P3/[0029, 0041]), the first and second supply sources supplying at least 1000 (see axes of symmetry are n-numbered wherein n is an integer between 2 and ∞, P5/[0059]) microfluidic reactors (104, 204, 304; P9/[0107]) arranged in parallel (see Fig. 3 & P4/[0047]) via an upstream channel or channels (see Figs. 1, 2), said upstream channel or channels positioned before the microfluidics reactors, the reactors each having at least one downstream

channel which is positioned after the reactors (e.g., outlet conduits, 105, 205, 305, P3/[0030]).

Regarding the resistance of channels, it is noted that the claim is not limited to the type of fluid used. In one example, pseudoplastic fluids (i.e., non-Newtonian fluid) which exhibit shear thinning characteristics where viscosity decreases with increasing rate of shear stress could be used in Anderson's device. When pressure is applied to the fluid in inlet 102, fluid would travel (lower viscosity) to outlet 105. However, without any pressure applied, the fluid would be stationary (higher viscosity) at the inlet 102. Therefore, "resistance" at upstream could be higher depending on the condition of the fluid used. In addition, it would have been obvious to one of ordinary skill in the art to design the device to have higher resistance at the inlet than the outlet to drive the fluid.

Further, these limitations are directed to processing of the microfluidic device where the limitation relies on fluid dynamics variable as well as reactor design variables which must take into account for changes in the fluid resistance. The variables, such as mass density, velocity, velocity vectors, energy needed to drive the fluid, volume, pressure, temperature, viscosity, as well as design of the reactor such as size of the reactor, pipe sizes, types, etc. Consequently, said limitations are given little patentable weight. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the channel dimensions to increase the resistance of upstream channels at least 10, 100 times larger than the resistance of the downstream channels to change the flow rate to modify mixing and reaction rate of fluids.

It is further noted that the desired flow resistance is a variable that can be modified, among others, by varying the dimensions of the flow channels. For that reason, the flow resistance would have been considered a result effective variable by one having ordinary skill in the art at the time the invention was made. As such, without showing unexpected results, the flow resistance cannot be considered critical. Accordingly, one of ordinary skill in the art at the time the invention was made would have optimized, by routine experimentation, the structure of Anderson et al. to obtain the desired flow resistance of its upstream channels is at least 10 times or 100 times larger than the resistance of the downstream channel or channels (*In re Boesch*, 617 F.2d. 272, 205 USPQ 215 (CCPA 1980)), since it has been held that where the general conditions of the claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. (*In re Aller*, 105 USPQ 223).

Regarding Claims 13 & 14, Anderson et al. further disclose the microfluidic system the microfluidic system comprising:

- a layer comprising inlet channels (e.g., one or more inlet microconduits 102, 103, 202, 203, 302, 303, P3/[0029, 0041]) for first and second fluid supply source and at least one outlet channel (e.g., outlet conduits, 105, 205, 305, P3/[0030]);
- a plurality of side channels (e.g., distribution channel, P5/[0066] & Fig. 3 (319)) with varying diameter and/or length (see Fig. 3); and

- microfluidic reactors (104, 204, 304; P9/[0107]) which are connected to the connecting channels via a port (e.g., inlet vent, Fig. 3 (322)) and through the connecting channels are in fluid connection with the inlet and outlet channels (see Fig. 3).

Although Anderson et al. teach the device having layers (e.g., lid, P6/[0076]), Anderson et al. fail to disclose the device having 3 layers having channels. It would have been obvious to one having ordinary skill in the art at the time the invention was made to manufacture the device in separate layers to minimize cost of manufacturing from one piece of material, since it has been held that constructing a formerly integral structure in various elements involves only routine skill in the art. *Nerwin v. Erlicnrnan*, 168 USPQ 177, 179.

8. Claims 1, 4 & 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Allen et al. (WO 01/28670).

Regarding Claims 1, 4 & 5, Allen et al. disclose a microfluidic system (e.g., microfluidic mixer, P3/L19-20 & Fig. 1 (100)) comprising:

- first and second fluid supply sources (e.g., first fluid and second fluid, respectively, P13/L19-20 & Fig. 6 (602, 604)),
- the first and second supply sources supplying microfluidic reactors arranged in parallel (e.g., mixers, P13/L22-23 & Fig. 6 (606)) via an upstream channel or channels (see annotated arrows indicating flow

pattern in Fig. 6 below), said upstream channel or channels positioned before the microfluidics reactors,

- the reactors each having at least one downstream channel which is positioned after the reactors (see annotation in Fig. 6 below); and
- the microfluidic reactors are all identical (see identical reactors 606 as shown in Fig. 6).

Regarding the resistance of its upstream channel at least 10, 100 times larger than the downstream channel, it is noted that the channel width *b* (upstream channels) is smaller than the exit channel width *m* or *s* (downstream channels), see Fig. 2a below. Therefore, while mixing fluids having same characteristics and the surface of each channels and reactors are made of same material with same surface smoothness and dimensions, it will display the flow resistance of all the upstream channels of the reactors is higher than the flow resistance in the down stream channels.

Although Allen et al. do not explicitly disclose regarding flow resistance, said limitations are directed to processing of the microfluidic device where the limitation relies on fluid dynamics variable as well as reactor design variables which must take into account for changes in the fluid resistance. The variables, such as mass density, velocity, velocity vectors, energy needed to drive the fluid, volume, pressure, temperature, viscosity, as well as design of the reactor such as size of the reactor, pipe sizes, types, etc. Consequently, said limitations are given little patentable weight. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the channel dimensions to increase the resistance of

upstream channels at least 10, 100 times larger than the resistance of the downstream channels to change the flow rate to modify mixing and reaction rate of fluids.

It is further noted that the desired flow resistance is a variable that can be modified, among others, by varying the dimensions of the flow channels. For that reason, the flow resistance would have been considered a result effective variable by one having ordinary skill in the art at the time the invention was made. As such, without showing unexpected results, the flow resistance cannot be considered critical. Accordingly, one of ordinary skill in the art at the time the invention was made would have optimized, by routine experimentation, the structure of Allen et al. to obtain the desired flow resistance of its upstream channels is at least 10 times or 100 times larger than the resistance of the downstream channel or channels (*In re Boesch*, 617 F.2d. 272, 205 USPQ 215 (CCPA 1980)), since it has been held that where the general conditions of the claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. (*In re Aller*, 105 USPQ 223).

With respect to 1,000 microreactors, Allen et al. shows in Fig. 6, a plurality of "reactors" connected together. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to connect at least 1,000 microfluidic reactors to study multiple reactions in parallel.

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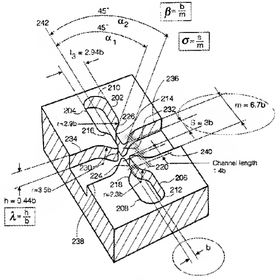

Fig. 2a

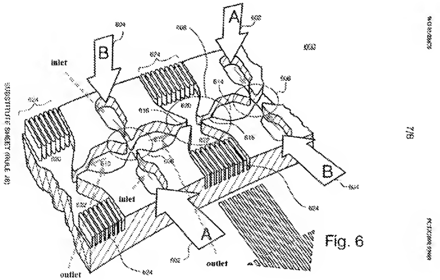

Fig. 6

9. Claims 1, 4, 5, 13 & 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ghosh et al. (US 5993750).

Regarding Claims 1 & 4, Ghosh et al. disclose a microfluidic system (e.g., integrated micro-ceramic chemical plant, Abstract & Fig. 1 (10)) comprising first and second fluid supply sources (Fig. 2 (12, 14)), the first and second supply sources supplying at least *3* microfluidic reactors (e.g., reaction chambers, C3/L47 & Fig. 4a (44, 46, 48)) arranged in parallel via an upstream channel or channels (e.g., communicating fluid channels, Fig. 4a (45)), said upstream channel or channels positioned before the microfluidics reactors (see Figs. 1-4), the reactors each having at least one downstream channel which is positioned after the reactors (see annotation in Fig. 4a below).

Although Ghosh et al. teach the system with 3 reactors, the reference fails to teach 1000 reactors. It would have been obvious to one having ordinary skill in the art at the time the invention was made to connect at least 1,000 microfluidic reactors to study multiple reactions in parallel.

In addition, Ghosh et al. fail to teach flow resistance. Although the reference does not explicitly disclose regarding flow resistance, said limitations are directed to processing of the microfluidic device where the limitation relies on fluid dynamics variable as well as reactor design variables which must take into account for changes in the fluid resistance. The variables, such as mass density, velocity, velocity vectors, energy needed to drive the fluid, volume, pressure, temperature, viscosity, as well as design of the reactor such as size of the reactor, pipe sizes, types, etc. Consequently, said limitations are given little patentable weight. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the channel dimensions to increase the resistance of upstream channels at least 10, 100

times larger than the resistance of the downstream channels to change the flow rate to modify mixing and reaction rate of fluids.

It is further noted that the desired flow resistance is a variable that can be modified, among others, by varying the dimensions of the flow channels. For that reason, the flow resistance would have been considered a result effective variable by one having ordinary skill in the art at the time the invention was made. As such, without showing unexpected results, the flow resistance cannot be considered critical. Accordingly, one of ordinary skill in the art at the time the invention was made would have optimized, by routine experimentation, the structure of Ghosh et al. to obtain the desired flow resistance of its upstream channels is at least 10 times or 100 times larger than the resistance of the downstream channel or channels (*In re Boesch*, 617 F.2d. 272, 205 USPQ 215 (CCPA 1980)), since it has been held that where the general conditions of the claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. (*In re Aller*, 105 USPQ 223).

Regarding Claim 5, Ghosh et al. further disclose a microfluidic system wherein the microfluidic reactors are all identical (see the reactors, 44, 46 and 48 having "identical" shape; also see C5/L48-50).

Regarding Claim 13, Ghosh et al. disclose a microfluidic system (e.g., integrated micro-ceramic chemical plant, Abstract & Fig. 1 (10)), wherein the microfluidic system comprises at least the following 3 layers:

- an inlet/outlet layer (20) comprising inlet channels (e.g., passageways, C3/L36 & Fig. 2 (12, 14) for first and second fluid supply source and at least one outlet channel (e.g., through-holes, C4/L55 & Fig. 2 (13, 15));
- a connecting layer (30) comprising a plurality of side channels (Fig. 3a (24, 26)) with varying diameter and/or length (see Fig. 3a); and
- a microfluidic layer (40), which comprises microfluidic reactors (e.g., reaction chambers, C3/L47 & Fig. 4a (44, 46, 48)) which are connected to the connecting channels via a port (e.g., through hole 28) and through the connecting channels are in fluid connection with the inlet and outlet channels of the inlet/outlet layer (see Figs. 1-4).

Regarding Claim 14, Ghosh et al. further disclose the microfluidic system wherein the system comprises a plurality of connecting layers connecting a plurality of microfluidic layers to a single inlet/outlet layer (see Fig. 1).

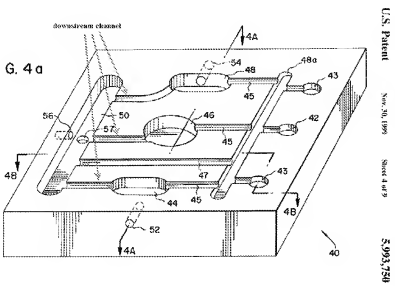

FIG. 4a

Response to Arguments

10. Applicant's arguments filed 12/17/2009 have been fully considered but they are not persuasive.

11. In response to Applicant's argument regarding 112 on P10 that the two fluids supplied to the upstream channel is the same for all reactors, therefore the temperature and viscosity of each type of fluid is sensibly the same in each reactor is unclear. In addition, the equation given in P10 is unclear.

First, the specification as filed states that at least 2 reactors receiving at least 2 different fluids from at least 2 external sources, with exactly one source per fluid, see [0067]. Even if two fluids have the same characteristics as in temperature and viscosity, there are more fluid dynamics variable as well as reactor design variables which must take into account for the changes in fluid resistance. The variables, such as mass density, velocity, velocity vectors, energy needed to drive the fluid, volume, pressure,

temperature, viscosity, as well as design of the reactor such as size of the reactor, pipe sizes, types, etc. Therefore, as disclosed in the specification as filed that the fluids are different, there are many factors which could change the condition of the fluid resistance.

Second, the equation in the argument lacks description of what "*m*" is. It is noted that the equation is only discussing the simplest case of channels of circular cross section. However, Claims 1 & 4 fail to limit to any design characteristics to the reactors or channels. Further, the process limitations are given little patentable weight in the product claims.

12. With respect to Anderson's teaching would create higher resistance at the outlet than the inlet, it is noted that the Claim is not limited to the type of fluid used. In one example, pseudoplastic fluids (i.e., non-Newtonian fluid) which exhibit shear thinning characteristics where viscosity decreases with increasing rate of shear stress could be used in Anderson's device. When pressure is applied to the fluid in inlet 102, fluid would travel (lower viscosity) to outlet 105. However, without any pressure applied, the fluid would be stationary (higher viscosity) at the inlet 102. Therefore, "resistance" at upstream could be higher depending on the condition of the fluid used. In addition, it would have been obvious to one of ordinary skill in the art to design the device to have higher resistance at the inlet than the outlet to drive the fluid.

13. With respect to argument regarding Allen et al. fail to teach resistance, Fig. 6 has been annotated to note Examiner's view of inlets & outlets. Although the reference is silent on resistance, the specification details on the dimensions of the device. See

annotation in Fig. 2a showing the inlet width "*b*" is narrower than the outlet width "*3b*", "*6.7b*", which would reads on the inlet having higher resistance than the outlet, assuming all other variables are constant.

With respect to 1,000 microreactors, Allen et al. shows in Fig. 6, a plurality of "reactors" connected together. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to connect at least 1,000 microfluidic reactors to study multiple reactions in parallel.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dean Kwak whose telephone number is 571-270-7072. The examiner can normally be reached on M-TH, 5:30 am - 4:00 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jill A. Warden can be reached on 571-272-1267. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

16 Jun 2010

/Jill Warden/
Supervisory Patent Examiner, Art Unit 1797

/D. K./
Examiner, Art Unit 1797